

1 1. A server in a network that receives requests from users of the network for information  
 2 belonging to an information source that has access to the server,  
 3 the server comprising:

4 a partial copy of the information belonging to the information source from which  
 5 the server provides the information when the requested information is contained therein;  
 6 and

7 an updater that updates the partial copy in response to update information which  
 8 the information source provides the server when information in the partial copy is  
 9 updated in the information source.

1 2. A server in a network that receives requests from users of the network for information  
 2 belonging to an information source to which the server has access,  
 3 the server comprising:

4 a partial copy of the information from which the server provides the requested  
 5 information when the requested information is contained therein and

6 an information fetcher that does not automatically fetch information from the  
 7 information source to the partial copy when the information is not contained therein but  
 8 rather fetches the information when needed for a probable future request.

1 3. The server set forth in claim 2 wherein:

2 the information fetcher makes a determination of what information is needed for a  
 3 probable future request on the basis of information usage information maintained in the  
 4 server and fetches information on the basis of the determination.

5. 4. The server set forth in claim 2 wherein:

2 the information fetcher receives a determination of what information is needed for  
 3 a probable future request from a source external to the server and fetches information  
 4 according to the determination.

5. 5. A server in a network that receives requests from users of the network for information

2 belonging to an information source that has access to the server,

3 the server comprising:

4 a partial copy of the information belonging to the information source from which the  
 5 server provides the information when the requested information is contained therein; and

6 an updater that updates the partial copy in response to update information which the  
 7 information source provides the server on the basis of a determination made at the  
 8 information source of a probable future request for information.

1 6. An information source that has access to one or more servers in a network, each server

2 including a partial copy of the information in the information source and the information

3 source having the improvement comprising:

4 an updater that responds to an update of information in the information source that  
 5 is contained in the partial copy by providing the update to the server.

1 7. The information source set forth in claim 6 wherein:

2 the information source is a database system of the type wherein trigger code may be  
3 associated with the information, the trigger code being executed when the information is  
4 updated; and

5 the updater is trigger code which is associated with information contained in the  
6 partial copy, the trigger code responding to an update of the information by providing the  
7 update to the server.

1 8. The information source set forth in claim 6 or claim 7 wherein:

2 the information source provides the information contained in the partial copy to  
3 the server; and

4 the updater determines the information that is contained in the partial copy from  
5 the provision thereof by the server.

1 9. The information source set forth in claim 8 wherein:

2 the information source provides further information for the partial copy to the server in  
3 response to a request from the server.

1 10. The information source set forth in claim 8 wherein:

2 the information source provides the further information on the basis of a  
3 determination made at the information source of a probable future request for  
4 information.

1 11. The information source set forth in claim 10 wherein the information source further  
2 comprises:

3 a log of requests for information and  
4 the information source makes the determination using the log of requests.

1 12. The information source set forth in claim 10 wherein:

2 the information source uses information about an event that will result in requests to  
3 make the determination.

1 13. The information source set forth in claim 12 wherein:

2 the information source uses information about a time of occurrence of the event to  
3 make the determination.

1 14. The information source set forth in claim 8 wherein:

2 the information source provides further information for the partial copy to the server  
3 on the basis of a determination made elsewhere of a probable future request for information.

1 15. An information source that has access to one or more servers in a network, each  
2 server including a partial copy of the information in the information source and the  
3 information source having the improvement comprising:

4 an information sender that determines a probable future request for information  
5 and provides the information for the probable future request to the server.

1 **16.** The information source set forth in claim 15 wherein the information sender further  
2 comprises:

3 a log of requests for information and  
4 the information sender makes the determination using the log of requests.

1 **17.** The information source set forth in claim 15 wherein:

2 the information sender uses information about an event that will result in requests to  
3 make the determination.

1 **18.** The information source set forth in claim 17 wherein:

2 the information sender uses information about a time of occurrence of the event to  
3 make the determination.

1 **19.** The information source set forth in claim 15 wherein:

2 the information source provides the information on the basis of a determination made  
3 elsewhere of a probable future request for information.

1 **20.** A method employed by an information source to update a partial copy of the information  
2 in the information source that is contained in a server accessible to the information  
3 source,

4 the method comprising the steps of:

5 detecting a change in information in the information source that is also in a partial

6 copy; and

7 sending an update message indicating the change to the server.

5/24/11  
21. An improved middle-tier Web server of the type that has an HTML layer for providing  
HTML pages in response to URLs, a Web application layer for providing data for the  
HTML pages in response to messages accompanying the URLs, and a data access  
layer that responds to requests from the Web application layer by querying remote  
datasets and returning a response to the query to the Web application layer,

the server having the improvement comprising:

a queryable cache containing copies of certain of the remote datasets,

the data access layer determining whether a copy of a dataset to be queried is present in  
the queryable cache and if the copy is present, querying the copy, and otherwise querying the  
remote data set.

22. The improved Web server set forth in claim 21 wherein

the query employs global identifiers for the remote data sets;

the copies are identified by local identifiers;

and the improvement further comprises:

a query analyzer which responds to a global identifier by returning an indication  
whether the remote dataset identified by the global identifier has a copy in the cache and if the  
remote dataset has a copy, returning the local identifier for the copy,

the data access layer responding to a returned indication that the remote dataset does not have a  
copy by querying the remote data set and responding to a returned indication that the remote

10 dataset does have a copy by querying the queryable cache using the returned local identifier for  
11 the copy.

1 **23.** The improved Web server set forth in claim 22 wherein:

2 the data access layer provides a global query context including all of the global  
3 identifiers used in the query to the query analyzer;

4 when there are copies of all of the remote datasets identified in the global query context,  
5 the returned indication returned by the query analyzer so indicates and the query analyzer returns  
6 a local query context including the local identifiers for the copies; and

7 the data access layer uses the local query context to query the queryable cache.

1 **24.** An improved data access interface of the type used in a server to provide a program with a  
2 standard interface for querying remote datasets,  
3 the improvement comprising:

4 a queryable cache that contains copies of certain of the datasets and is accessible to the  
5 data access interface,

6 the improved data access interface receiving a query for a remote dataset in a form required by  
7 the interface from the application program, determining whether a copy of a dataset to be queried  
8 is present in the queryable cache, and, if the copy is present, querying the copy, and otherwise  
9 querying the remote dataset,

10 whereby the queryable cache is transparent to the program.

1 25. The improved data access interface set forth in claim 24 wherein  
2 the program uses global identifiers for the remote data sets and  
3 the copies in the queryable cache have local identifiers; and  
4 the improved data access interface further comprises:  
5 a query analyzer that receives the global identifier for a dataset being queried and if  
6 there is a copy of the data set indicated by the global identifier, returns the local identifier to the  
7 data access interface,  
8 the data access interface using the local identifier to query the copy.

1 26. The improved data access interface set forth in claim 24 wherein:  
2 the query analyzer further indicates to the data access interface whether the copy of the  
3 dataset is in the queryable cache.

1 27. The improved data access interface set forth in claim 24 further comprising:  
2 a dataset manager that determines a dataset for which a copy is needed in the cache,  
3 obtains a copy of the remote dataset and adds the copy to the cache.

1 28. The improved data access interface set forth in claim 27 wherein:  
2 the dataset manager further determines a dataset for which a copy is no longer needed in  
3 the cache and removes the copy from the cache.

1 29. The improved data access interface set forth in any of claims 27 or 28 wherein:



2 the dataset manager determine whether to add or remove a dataset by determining a  
3 likelihood that a query will be made to the dataset.

1 **30.** The improved data access interface set forth in claim 29 wherein the improved data access  
2 interface further comprises:

3 a query log that lists past queries that have been made to the standard interface and  
4 the dataset manager uses the query log to determine a likelihood that a query will be  
5 made to a dataset.

1 **31.** The improved data access interface set forth in claim 29 wherein:

2 the dataset manager uses information about an event that will result in queries to a  
3 dataset to determine a likelihood that a query will be made to a dataset.

1 **32.** The improved data access interface set forth in claim 31 wherein:

2 the dataset manager uses information about a time of occurrence of the event to  
3 determine a likelihood that a query will be made to a dataset.

1 **33.** The improved data access interface set forth in claim 24 wherein

2 when a change occurs in a remote dataset, an indication of the change is sent to the  
3 server and

4 the improved data access interface further comprises:

5 an update receiver that receives the indication and modifies any copy of the dataset as  
 6 required by the indication.

1 **34.** A method of using a data access interface in a server to query remote datasets, the data  
 2 access interface being of a type that provides a standard interface for querying the  
 3 remote data sets to a program and the data access interface having access to a queryable  
 4 cache that contains copies of certain of the remote datasets and  
 5 the method comprising the steps of:  
 6 receiving a query for a remote dataset in a form required by the standard interface;  
 7 determining whether a copy of a dataset to be queried is present in the queryable cache;  
 8 and  
 9 if the copy is present, querying the copy and otherwise querying the remote dataset,  
 10 whereby the queryable cache is transparent to the program.

1 **35.** The method set forth in claim 34 wherein  
 2 the program uses global identifiers for the remote data sets and  
 3 the copies in the queryable cache have local identifiers; and  
 4 the method further includes the steps of :  
 5 receiving the global identifier for a dataset being queried; and  
 6 if there is a copy of the data set indicated by the global identifier, returning the local  
 7 identifier to the data access interface,  
 8 the local identifier being used in the step of querying the local copy.

Add  
A5

Add B4  
Add C2  
Add D6